

## INTERNATIONAL WORK

### Miya River Flat-V Weir Design

WRA has been working with SRK Consulting on the hydrology and monitoring aspects of the Simandou Iron Ore Project in Guinea since 2021. One of the components of this work was to design a gauging weir that would serve as an environmental compliance point for flow and water quality on a river draining the catchment containing mine infrastructure. A concrete Flat-V weir was selected which will allow measurement of flows ranging from 0.030 to 33 m<sup>3</sup>/s.

The work to design the weir included selection of the weir site using LiDAR data, topographic survey, ground investigation using trial pits, analysis of results, hydraulic design to ensure that a hydraulic jump forms inside the stilling basin under flood flows, design of a temporary diversion culvert with dams, groundworks including dewatering, foundation and rock grouting, and channel bed preparation. The overall dimensions of the weir followed those of the natural channel. Crest tapping was included so that accurate measurement can be maintained in excess of the modular discharge up to the design discharge. The design also included earth-fill and ground reinstatement on either side of the weir walls and facilities for the installation of continuous water level and water quality instrumentation, a side-looking doppler system for continuous discharge measurement and automatic water sampling equipment.

WRA delivered a design report, a set of ten engineering drawings, specification and bill of quantities for inclusion in Rio Tinto's construction tender documents.

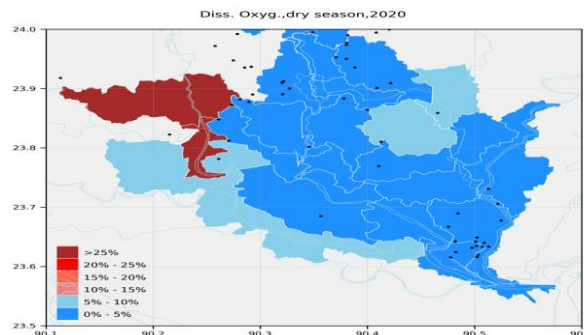


Flow gauging on the Miya River

### Hydrology and WQ Impacts in Bangladesh

Primark and other garment manufacturers in Bangladesh are concerned about their impacts on the rivers around Dhaka. Paul Whitehead, Prof Abed Hossain (BUET), Giambi Bussi and Cordelia Rampley have been evaluating impacts of discharges on flows and water quality in the Dhaka Rivers. This has been possible using the new INCA model set up for

Bangladesh undertaken recently (see last Bulletin-[www.watres.com](http://www.watres.com)). Comparisons between Primark contributions currently against the current high levels of pollution are possible, as well as assessing how this will change in the future as Bangladesh implements a major clean-up programme.



Preliminary assessment of impacts of Primark on DO Concentrations in Dhaka Rivers

## UK WORK

### Hydrological Survey for Flood Study

Harvey Rodda has been engaged to undertake a Hydrology Survey for a rural property near Moreton-in-Marsh to identify the risk of flooding from all sources in relation to a Planning Appeal for an application submitted on a neighbouring block of land. The survey included gathering background environmental data, hydrological modelling in GIS and fieldwork for ground-truthing site levels and identifying the soil conditions. The area was found to be underlain by impermeable mudstone, with slowly permeable clay loam soils which would become readily saturated in winter and be prone to surface water flooding. The work identified that the predominant surface water flow pathways were towards the proposed development site, which was also surveyed at a lower level than the bordering main road. This demonstrated a high risk of flooding at the development site from surface water and therefore was considered unsuitable as a residential site.

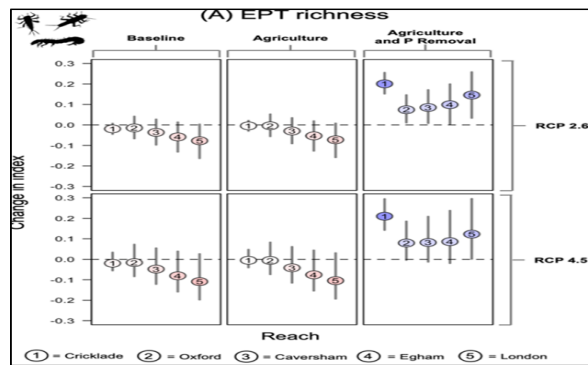


Flooding at Morton

The small area of the development site (just 200m by 25m) also meant that the area for surface water attenuation measures would be limited. WRA also presented information against the proposed development at the Planning Appeal which was decided in favour of rejecting the development.

### Climate Change impacts on Ecology

Paul Whitehead and Giambi Bussi have been working with Oxford University Biology Department to support a large NERC funded experimental programme to assess the impacts of climate change on aquatic ecology. The experimental work at Wytham has been designed as a multiple replicate warming and nutrient change experiment to simulate future climate change and land use change. The Oxford and WRA team have been analysing the experimental data and macroinvertebrate data sets from the EA. A multivariate Macroinvertebrate model has been developed and used to evaluate invertebrate diversity across the Thames Catchment under different climate change scenarios. A paper is in press.



Species Richness estimates under different RCP Climates and at 5 locations along the River Thames

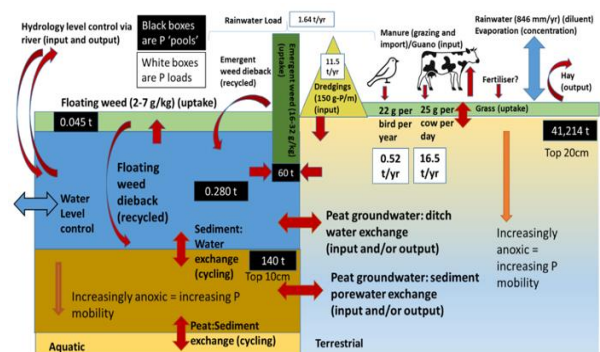
### Nutrient Fluxes on Somerset Levels

The Somerset Levels and Moors (SLMs) catchments are subject to intensive agriculture and wastewater inputs which leads to nutrient contamination of the inflow waters, to the extent that they fail Water Framework Directive Good Status targets for P concentrations and are designated as ‘Unfavourable Declining’, owing to eutrophication. Sean Comber has undertaken a project utilising monitoring data for nutrients in ditches, dipwells, soil, sediment and harvested plant biomass to provide an assessment of the overall apportionment of P inputs and reservoirs. Combining datasets generated estimates of stores, fluxes and loadings of P. The data show large temporal and spatial changes in the concentrations of P and nitrogen (N) across the peat rich soils. Suggestions were provided as to how an altered hydrological regime and plant biomass harvesting could be used to reduce further eutrophication and how legacy P stored in the peat body could be mobilized by flooding and over time evacuated

from the wetland. The findings suggest how pluviculture (wet agricultural crops) and rewetting of the peat body may help to restore the Ramsar wetland.



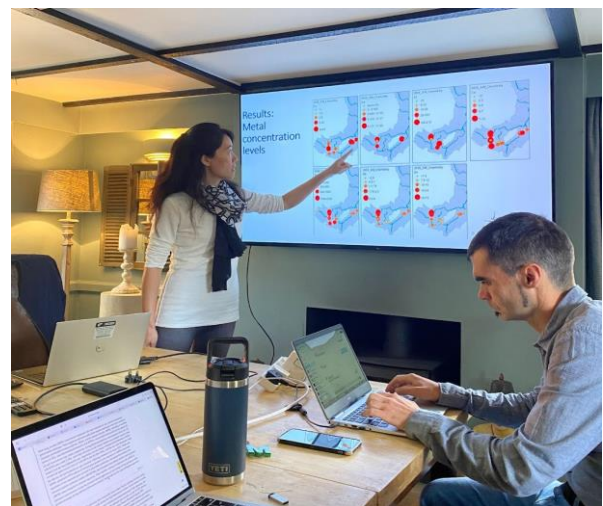
Evidence of Eutrophication in Somerset Levels



A Phosphorus Balance for the Somerset Levels

### Other News

Paul Whitehead and Martyn Futter organised a mini Science Camp meeting on water quality monitoring in Blewbury. Colleagues from Sweden, Finland, Italy, USA and the UK attended and a very productive set of discussions were initiated with some longer term plans-venue- the Red Lion in Blewbury.



Prof Li Jin giving a presentation on WQ in Ethiopia

### Next WRA Board Meeting

12<sup>th</sup> January 2023

The WRA Bulletin is a quarterly publication, and relies on contributions submitted by Partners, Associates and Consultants. The document is circulated by email, and published on the WRA web-site, aiming to keep the WRA network up-to-date with respect to current activities. Please email contributions for future issues to Paul Whitehead: [paul.whitehead@watres.com](mailto:paul.whitehead@watres.com)

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